Radioactive Determination of Potassium in Plant Ashes : Preliminary Report

AUTHOR(S):

Nagayama, Shu; Tsumori, Kunihiko; Shimizu, Sakae

and used as a cathode. It is filled with 1 cm. Hg Alcohol vapor and 10 cm. Hg of Ar gas (several per cent nitrogen gas is contained as impurity). Several characteristics of this counter are shown in Fig.2, which show the plateau of about 200 volts with a slope of less than 10 %. This slope will become smaller, if purified Ar gas is used.

It is feared that the characteristics become worse on account of accumulation of surface charge at a large counting rate or after use for a long time because of the non-conductivity of gas. As shown in Fig.3, the properties of the counter remain unchanged in such cases.

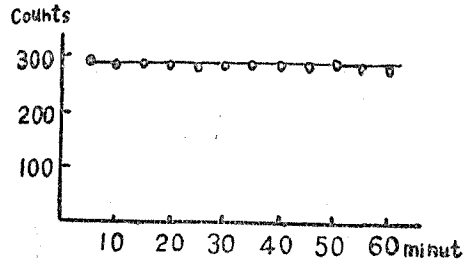

Fig.3

The photosensitivity was investigated, but such an effect was not found.

Next, we tried to use it as a dipping counter. It has no layer of aquadag. The active solution in which the counter is dipped acts as a cathode. The wall-thickness and filling gas are the same as before. The characteristics obtained are similar as shown in Fig. 2.

A small probe counter also investigated. A very long plateau (about 600 volts) is found in this case. It, however, is not yet obviously explained.

The precise investigations of these counters are now in progress.

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6. Radioactive Determination of Potassium in Plant Ashes

(Preliminary Report)

Shu NAGAYAMA, Kunihiko TSUMORI and Sakae SHIMIZU

(K. Kimura Laboratory)

As an analytical method for determining potassium content in plant ashes (A. M.Gaudin *et al.*, *Ind. Eng. Chem., Anal.Ed.*, **20**, 1154 (1948)), we measured the natural radioactivity of K^{40} in them with an end-window type G-M counter, whose thickness of a mica window was 2.9 mg./cm^2. and its area 3.14 cm^2.

For the calibration curve to measure the amounts of potassium by the radioactivity of K^{40} we determined the proportionality existing between the counting rates and the percentages of potassium, using the standard samples. The standard samples used were the potassium compounds (KCl, KNO_3, $K_2Cr_2O_7$) mixed with the sodium chloride or calcium carbonate, and the percentages of potassium were from 5 percent to 28 percent. We evaluated the self-absorption curve of the beta-rays from K^{40} in the samples. The counting rates became constant in the range of thickness of samples greater than 0.35 g./cm^2. Therefore, we took the thickness of samples as 0.4 g./cm^2. The samples were generally placed 3 mm. under the window of the G-M counter throughout these measurements.

Using the above mentioned calibration curve, we determined the percentages of potassium content from the counting rates of radioactivity in plant ashes. Plant ashes used were as follows: *Sasa paniculata, Miscanthus sinensis, Artemisia vulgaris L, Pteridium aquilinum Kuhn, Cyperus serotinus Rottb, Serrulata spontanea Makino, Petasites japonicus.* To ascertain the amounts of potassium in plant ashes, we quantified them by the chemical chloroplatinate method. There were differences of about 3 percent bewteen the values estimated from counting rates and those determined by chemical method. Further researches are now in progress.

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7. Study on High Dielectric Constant Ceramics. (XVII)

Coupled Vibrations in Electrostrictive Vibrators

Kiyoshi ABE, Tetsuro TANAKA and Koji UO

(Abe Laboratory)

Theoretical analysis of coupled vibration, which can be seen in an electrostrictive vibrator having the shape of rectangular plate, cylinder or hollow cylinder, were considered in previous report and it was verified that such theory agrees quite well with the experimental results in case of $BaTiO_3$ ceramic vibrator. Higher harmonics of vibration, which have been neglected previously and must be taken into consideration in actual case, will be discussed in this report.

The resonant angular frequencies (r.a.f.) of two independent vibrations must be described as follows considering higer harmonic vibrations:

$$w_a^2 = \frac{\pi^2 E,}{a_m^2 \rho}, \quad w_b^2 = \frac{\pi^2 E}{b_n^2 \rho} \qquad (1)$$